

## Critical success factors for successful enterprise resource planning implementation at Indian SMEs

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### Abstract

Small and medium-size enterprises (SMEs) have been receiving lesser focus from the software vendors than large enterprises (LEs). Research on the implementation of ERP in certain European countries shows that the job of implementing an Enterprise Resource Planning (ERP) is a riskier business for SMEs than for LEs. In this paper, a framework has been adopted to cover both the national (Indian) and the organization size (SMEs) aspects to identify and rank the Critical Success Factors (CSFs) that influence the success of ERP implementation at Indian SMEs. This paper attempts to build a consensus from the previous research and to derive a unified ERP implementation success model of the critical success factors to guide a successful ERP implementation at Indian SMEs that differs from existing models in that it has a broader and more holistic focus due to the coverage of thirty CSFs. A model is developed with the help of quantitative survey based method to identify and rank the thirty critical success factors and then a framework has been proposed in terms of recommendations for managing these CSFs. Two close ended questionnaires were used to collect the data from the Indian ERP consultants, those who are having experience of ERP implementation in India for almost all types of Indian industries including Indian SMEs. The data collected were analyzed using statistical techniques such as factor analysis and non parametric tests. This paper argues that ERP implementation at Indian SMEs should extend its scope beyond the configuration to the process, enterprise, technology, vendor, end-user, human resource, performance, quality, strategy and project related issues by considering these thirty critical success factors for the success of ERP implementation at Indian SMEs that may put Indian SMEs on the competitive position. The ERP implementation success model simplifies the functionality of ERP implementation at Indian SMEs. The simplification of system makes easier to understand the ERP requirements. Although limited sample size restricted to Indian SMEs may limit generalization but still these factors can be put into practice to facilitate the process of successful ERP implementations at Indian SMEs. It is hoped that this research will help to bridge the current literature gap and provide practical advice for both academics and practitioners for successful ERP implementation at Indian SMEs.

**Keywords:** ERP, CSFs, Indian ERP, Implementation, SMEs , ERP Implementation, Indian SMEs.

### 1. Introduction

Technology has had a major impact on every organization. Whether it is a small or large organization, being competitive is the key to success. Issue in dealing with a new ERP system is not solely technology, but it involves high degree of planning and commitment too. SME's face many of the same competitive problems as larger organizations, but have limited resources, experience and staffing skills (Nelson and Millet, 2001). As with the larger enterprises, ERP implementation is becoming critically important to SMEs in streamlining business processes, improving operational performance, and integrating data. Understanding the CSFs for the success of ERP implementation is more critical to SMEs than larger organizations due to their more limited resources. SMEs may not be able to withstand the financial impact of the partial failures and project abandonments that have impacted on many of their larger counterparts (Muscatello *et al.*, 2003). Most of the existing studies that investigate the success factors for ERP implementations focus on the projects that have been carried out in North America and Western Europe. In recent years, researchers such as (Martinsons, 2004), have examined ERP implementations in other countries. Considering that most ERP systems are designed by western information technology (IT) professionals, the structure and processes embedded in these systems

reflect western culture. As a result, fundamental misalignments are likely to exist between foreign ERP systems and Indian companies requirements. These factors can result in design with undesirable reality gaps, which tend to lead to underperforming systems (Walden and Browne, 2002).

Over the past years, the global economic crisis has put the spotlight on many business organizations of any size. With India not being spared of the impact, large establishments have attempted to tackle this crisis in their own ways. SME's are increasingly being brought into focus on account of their huge growth potential. Various researchers have recommended research into the implementation and use of ERP at SMEs (Huin, 2004; Jacobs and Bendoly, 2003; Muscatello *et al.*, 2003).

Huin (2004) argues that "unless differences between small and large firms are understood, managing ERP projects in SMEs will continue to be slow, painful and at times even unfruitful". Thus, it appears from previous studies that organizational conditions at SMEs differ from that of large organizations. This suggests that the relative importance of CSFs in ERP implementation may also differ. Since literature on ERP implementation at Indian SMEs is relatively sparse, this research helps to narrow this knowledge gap by investigating ERP implementation at Indian SMEs.

The definition of Indian SMEs, according to MSME Development Act, 2006 is based on the ceilings on investment for an enterprise (micro, small and medium) is adopted in the current paper (see Table A – Appendix). Different ERP implementation phases are associated with specific ERP implementation problems (Markus and Tanis, 2000). The ERP implementation literature has provided a solid theoretical background to ERP research. However, there seems to be insufficient research investigation on the critical success factors for successful ERP implementation at Indian SMEs for all the phases of ERP implementation from planning to post ERP implementation. This study aims at achieving this objectives by considering ERP implementation process based on "Synthesized process model for ERP implementation phases" (Shanks *et al.*, 2000) to identify and rank the critical success factors for the success of ERP implementation at Indian SMEs (see Appendix).

### 1.1 Research Gap

Critical Success Factors (CSFs) approach was first used by Rockhart (1979) in IS area. It has been applied to many aspects of IS (Information Systems) including project management, manufacturing systems implementation, reengineering, and, more recently, ERP systems implementation (Brown *et al.*, 1999). Within ERP implementation context, CSFs are defined as "factors needed to ensure a successful ERP project" (Motwani *et al.*, 2002). Several studies identified the critical factors needed to enable project managers and management boards to improve their ERP implementation projects. Implementing successful ERP systems is investigated by many researchers. Their general focus was on identifying CSFs that need to exist in large organization to have successful ERP implementation. These factors have been tested in different organizations in many developed and developing countries by many researchers (Al-Mashari, 2001; Akkermans and Helden, 2002). These factors include, but not limited to, clear objectives, user involvement, effective communications, change management, project team, project champion, consultants, architecture choices, minimal customization, excellent project management, top management support, data analysis and conversion, business process reengineering, user training and education etc.

It has to be noted that much of the attention focused on the critical success factors for the successful ERP implementation in the large enterprise. The success of ERP implementation in both SMEs and LEs are equally important thus the gaps in Indian ERP implementation are:

- What are the critical factors that influence success of ERP Implementation at Indian SMEs?
- Which critical factors should get high priority in judging the success of ERP implementation at Indian SMEs?

The main objectives of this paper are to identify and categorize the critical factors influencing success of ERP implementation at Indian SMEs. To find out the factors that can be defined under each component with their importance. To find out the reliability of instrument totally for defining each factor and to rank the critical success factors according to their importance.

This research paper was organized in four sections. Section 1 introduces background information by providing the general concept of ERP systems and motivation for the research in the area of ERP implementation at Indian SMEs. It reviews the previous efforts and findings in related areas. It presents an overview of previous research on ERP implementation in information systems. Sub section 1.1 defines the research gaps. Section 2 presents the research methodology, showing survey instruments and their descriptions. Section 3 deals with the results of the survey that were examined by reliability, validity test and exploratory factor analysis etc, to know that whether the survey instruments were developed properly or not. Previous research, theories and fundamentals of project management in ERP implementation are presented to form the theoretical background of the research model. It provides the conceptual research model, describing factors and components. It contains the analysis and interpretation of main research findings along with the recommendations. Section 4 summarizes the study and concludes by examining the contributions of the completed research model and presents the limitations for further advance research in this area.

## 2. Research Methodology

The present study is exploratory in nature which identifies thirty critical success factors for the success of ERP implementation at Indian SMEs along with the KCSFs (Key Critical Success Factors) by the ranking of those CSFs according to their importance. It gives insights into the phenomenon of CSFs for the success of ERP implementation at Indian SMEs. It does not go deep into the phenomenon of CSFs and so it cannot be determined as descriptive. Exploratory research has the goal of formulating problems more precisely, clarifying concepts, gathering explanations, gaining insights, eliminating ideas and formulating hypothesis. Exploratory research here is performed by a survey. A quantitative survey based approach was used. The ERP consultants from India have been selected for the data collection using non probability sampling method. The primary data was collected by using self structured two close ended questionnaires. A five item Likert scale was designed with each statement having five alternatives to choose from Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1 for the first questionnaire. Second questionnaire ask for the ranking of CSFs on 1 to 30 points scale to identify Key Critical Success Factors (KCSFs) where 1=Most Important and 30= Least Important. The Likert scale is relatively easy to construct compare to other scales. The process is to collect the large number of statements that meet two criteria: (1) each statement is believed to be relevant to the attitude being studied and (2) each is believed to reflect favorable or unfavorable position on that attitude. Respondents should give their level of agreement to the statements. The pilot test was done for ten respondents. Later on both questionnaires were given to 50 respondents. Statistically any same size which is 30 or more than 30 are generally considered as the large sample size, in this research sample size was 50 in order to maintain the reliability and validity of the survey that is statistically large enough (Kothari, 1991). These respondents were from different background and different genders. Each questionnaire consists of 30 questions (survey items) mainly dealing with 30 critical success factors for the success of ERP implementation at Indian SMEs. In both the questionnaire, respondents were asked to indicate their perception to identify and rank the thirty CSFs for the success of ERP implementation at Indian SMEs. The objectives of the research and the pattern of the questions were explained in detail to the respondents so that the bias will be as low as possible. Factor analysis was used to reduce the variables and detect the structure in the relationship between variables along with Friedman test to rank the CSFs according to their importance. The analysis of data was done by applying factor analysis, descriptive statistics and nonparametric test using SPSS V 18.0.

Quantitative survey based method was used to explore “what are the possible critical success factors” that contribute in the success of ERP implementation at Indian SMEs. Two close ended questionnaire were used to collect the data from the 50 Indian ERP consultants those who are having experience of ERP implementation in India for almost all types of Indian industries including Indian SMEs. Sample was drawn from ten national and international well known IT sector companies which are involve in world wide ERP implementation including Indian SMEs. The Indian ERP consultants have been selected for the data collection using non probability sampling method. The data collected were analyzed using statistical techniques such as descriptive statistics, reliability tests, exploratory factor analysis and non parametric tests. In order to explore thirty CSFs with the KCSFs, both the close ended questionnaires were customized with the help of literature reviews and expert’s opinions. Later on it has been standardized for this research with the help of Cronbach’s Alpha readability and supported by exploratory factor analysis.

## 3. Analysis and Interpretation

### 3.1. The Proposed Theoretical Framework

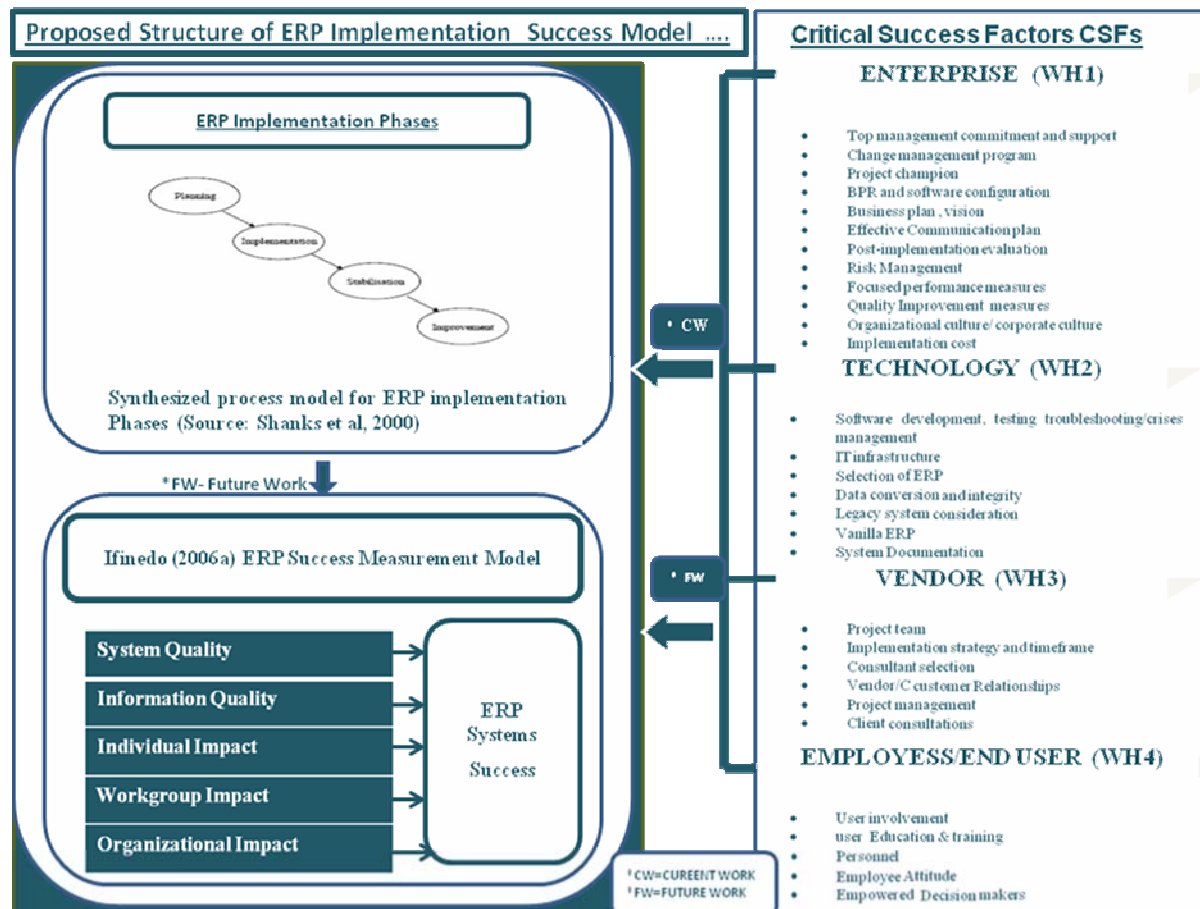
The theoretical framework (Figure 1) is represented by four main sets of factors in terms of working hypothesis (just to get the direction for exploratory research), namely enterprise related CSFs, technology related CSFs, vendor related CSFs and employee/end-user related CSFs for the success of ERP implementation at Indian SMEs while considering all phases together. A theoretical implementation process was identified, such that it is suggested that there is an explicit linkage between factors and successful ERP implementation phases. Figure 1 shows the proposed theoretical framework for the successful ERP implementation at Indian SMEs. The proposed model, referred to as the conceptual ERP implementation success model for Indian SMEs. As the success of ERP systems can be classified into two categories; the success of ERP adoption and the success of ERP implementation. The success factors for the large enterprise as suggested by the various researchers in literature review are used in the model because these were already validated in previous research and confirmed by several experts interviewed for the large enterprise. This research hypothesize (working hypothesis) these factors directly influence the success of ERP Implementation at Indian SMEs. Based on the proposed model, this research developed the initial instrument (two close ended questionnaires) to identify the CSFs and KCSFs for the success of ERP implementation at Indian SMEs. The following four hypotheses were the working hypothesis for this research:

WH1: there is relationship between enterprise related critical success factors of the large enterprise and success of ERP implementation at Indian SMEs during all the phases of ERP implementation.

WH2: there is relationship between technology related critical success factors of the large enterprise and success of ERP implementation at Indian SMEs during all the phases of ERP implementation.

WH3: there is relationship between vendor related critical success factors of the large enterprise and success of ERP implementation at Indian SMEs during all the phases of ERP implementation.

WH4: there is relationship between employee/end-user related critical success factors of the large enterprise and success of ERP implementation at Indian SMEs during all the phases of ERP implementation.



**Figure 1.** Proposed theoretical framework (Conceptual ERP Implementation Success Model) (Source: Authors, MS PowerPoint)

### 3.2 Estimation

The conceptualization of survey instrument constructs is based on preliminary literature review to form the initial items. The personal interviews with practitioners and experts views for scale purification suggest that the survey instruments have strong content validity. Construct validity is evaluated by performing factor analysis. High correlations among the CSFs are considered to indicate construct validity. Estimates greater than .70 are generally considered to meet the criteria for reliability. In Table 1, the composite reliability estimates for the measurement scales are listed. From the Table 1, it is observed that reliability is above 0.75 which states that sufficient internal consistencies have been judged for the reliable measure and construct validity.

**Table 1.** The Composite Reliability (Source: SPSS V 18.0)

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.780	.786	30

Table 2 (Part I) presents the means and standard deviations for first questionnaire that is identification of 30 CSFs in descending order (5=Strong Agree, 4=Agree, 3= Neutral, 2=Disagree and 1=Strong Disagree). Second part of the descriptive statistics see Table 2( Part II) presents the means and standard deviations for the second questionnaire that is ranking of 30 CSFs in order of their importance (1=Most Important and 30= Least Important). The items used in constructing the survey for this study were adapted from several relevant prior research studies of the large enterprise. The data collected on the critical success factors were first perused to check whether the data could be analyzed using factor analysis or not. The results of this analysis indicate that the correlations among the factors were high and the Bartlett's test of sphericity was significant. The data were hence found suitable to conduct factor analysis. An exploratory factor analysis was conducted on the different measures to purify the instrument and to validate the various dimensions underlying the data set. Factor analysis was also used to identify underlying factors or the dimensional composition of instrument. The 50 responses were examined using principal-components factor analysis as the extraction technique and Varimax as the rotation method. Only factors with Eigen value (total variance explained) more than 1 are included in final solutions.

Factor loading is simple correlation between the factors and all the variables. It can be used to decide which variable belongs to which factors. This judgment can be done best in rotated factor matrix, see Table 3. Each variable belongs to the factors with which it has the highest loading (neglect the negative sign), see Table 3. This process is used to find out all the constituent variables of each factors. It is seen from the total variance explained in the Table that 10 factors have Eigen value over 1. It shows cumulative variance of 76.415 % which means a good factor analysis has been done. The factor analysis performed on 30 items resulted into the extraction of 10 components, see Table 3. Based on the content of each component they were suitably named. Factor analysis was used to identify the critical success factors that influence the success of ERP implementation at Indian SMEs.

- The factors were fixed at ten. See Table 4.
- They together contribute almost 76.415 % of total variance.
- The most important factor among these is component 1: Process related CSFs, which contribute almost 19.356% of the total variance. See Table 4.
- The variables are divided into different factors based on the values in the rotated component matrix (the higher values are taken). The divisions of variables into different factors are given in Table 4.

Order of importance is also presented with the help of Friedman test for questionnaire two (Ranking of CSFs). Table 5 presents ranking from the questionnaire two. In case of second questionnaire, the Friedman test results has the significance value (.000) which is less than the standard assumed value of this test (Typically .05) and the resulted chi square value being higher this means that mean ranks given to the 30 CSFs are not same, see Table 5. The order of importance can also be understood from the descriptive statistics see Table 2. As shown in the Table 5 the most important factor is business plan, vision (mean rank 4.26) followed by the top management commitment and support (mean rank 4.58), project champion (mean rank 4.78) on 1 to 30 points scale where 1=most important and 30=least important. Table 5 presents Interpretation of output from the Friedman Test analysis based on questionnaire two that is ranking of Critical Success Factors.

### 3.3 Findings

Significant relationships are found between CSFs and the success of ERP implementation at Indian SMEs. Working hypothesis has been tested with the help of factor analysis and few more categories were also identified for successful ERP implementation at Indian SMEs (see Table 4). Thirty critical success factors were identified with the help of ERP implementation success model (see Figure 2) along with the Key Critical Success Factors (see Table 5) to make successful ERP implementation at Indian SMEs. Study concludes that all these thirty critical success factors influence, the success of ERP implementation at Indian SMEs (see Table 4) and they have different priorities (ranking) during ERP implementation at Indian SMEs (see Table 5).

The study also makes groups of important factors for the success of ERP implementation at Indian SMEs by identifying KCSFs and factor analysis (see Table 4 and 5). Since the grouping of variables are done on basis of data collected from the Indian ERP consultants, the results of the study are also acceptable for Indian ERP vendors and will be acknowledged by the Indian ERP consultants too. The ERP Implementation success model for the success of ERP implementation at Indian SMEs along with the list of KCSFs can be used during all the phases of ERP implementation at Indian SMEs to make ERP successful because the boundaries between planning, implementation, stabilization and improvements are not rigid. The ERP implementation success model simplifies the functionality of ERP implementation at Indian SMEs. The simplification of system makes easier to understand the ERP requirements. Commonly, a better system is easier to understand, implement and maintain for the users and the implementers. By using this model for small and medium-size companies ERP implementation, especially in India, Indian SMEs can achieve global business process by implementing ERP systems efficiently.

**Table 2.** Descriptive Statistics for Questionnaire One and Two (Source: SPSS V 18.0)

Item Statistics			
Identification of Critical Success Factors-CSFs	Mean	Std. Deviation	N
CSF1 Top Management Commitment & Support	4.64	0.48487	50
CSF2 Change Management Process	4.7	0.46291	50
CSF3 BPR & Software Configuration	4.7	0.46291	50
CSF4 Project Champion	4.66	0.47852	50
CSF5 Business Plan, Vision	4.76	0.43142	50
CSF6 Effective Communication Plan	4.66	0.47852	50
CSF7 Post Implementation Evolution	4.68	0.47121	50
CSF8 Risk Management	4.62	0.49031	50
CSF9 Focused performance Measure	4.68	0.47121	50
CSF10 Quality Improvement Measure	4.68	0.47121	50
CSF11 Organization/Corporate Culture	4.56	0.50143	50
CSF12 Implementation Cost	4.64	0.48487	50
CSF13 Software development, testing, trouble shooting & crises management	4.66	0.47852	50
CSF14 IT Infrastructure	4.66	0.47852	50
CSF15 Selection of ERP Package	4.66	0.47852	50
CSF16 Data Conversion & Integrity	4.66	0.47852	50
CSF17 Legacy System Consideration	4.76	0.43142	50
CSF18 Vanilla ERP	4.68	0.47121	50
CSF19 System Documentation	4.54	0.50346	50
CSF20 Project Team	4.62	0.49031	50
CSF21 Implementation Strategy & Timeframe	4.56	0.50143	50
CSF22 Consultant Selection	4.54	0.50346	50
CSF23 Vendor/Customer Relationships	4.48	0.50467	50
CSF24 Project Management	4.56	0.50143	50
CSF25 Client Consultations	4.46	0.50346	50
CSF26 User Involvement	4.6	0.49487	50
CSF27 User Education & training	4.42	0.49857	50
CSF28 Personnel/Staff	4.5	0.50508	50
CSF29 Employee Attitude & Morale	4.52	0.50467	50
CSF30 Empowered Decision Makers	4.44	0.50143	50

**Table 3.** Descriptive Statistics for Questionnaire One and Two (Source: SPSS V 18.0)

Descriptive Statistics			
Ranking of Critical Success Factors-RCSFs	Mean	Std. Deviation	N
RCSF1 Top Management Commitment & Support	4.58	2.21396	50
RCSF2 Change Management Process	4.96	2.82814	50
RCSF3 BPR & Software Configuration	6.88	2.84741	50
RCSF4 Project Champion	4.78	2.81606	50

**Table 3. (cont'd)** Descriptive Statistics for Questionnaire One and Two (Source: SPSS V 18.0)

Descriptive Statistics			
Ranking of Critical Success Factors-RCSFs	Mean	Std. Deviation	N
RCSF5 Business Plan, Vision	4.26	2.64042	50
RCSF6 Effective Communication Plan	5.44	3.13089	50
RCSF7 Post Implementation Evolution	6.18	2.92554	50
RCSF8 Risk Management	5.74	2.59363	50
RCSF9 Focused performance Measure	4.86	3.09054	50
RCSF10 Quality Improvement Measure	7.32	2.02474	50
RCSF11 Organization/Corporate Culture	14.58	2.21396	50
RCSF12 Implementation Cost	14.96	2.82814	50
RCSF13 Software development, testing, trouble shooting & Crises Management	16.88	2.84741	50
RCSF14 IT Infrastructure	14.78	2.81606	50
RCSF15 Selection of ERP Package	14.26	2.64042	50
RCSF16 Data Conversion & Integrity	15.38	3.06987	50
RCSF17 Legacy System Consideration	16.18	2.92554	50
RCSF18 Vanilla ERP	15.74	2.59363	50
RCSF19 System Documentation	14.86	3.09054	50
RCSF20 Project Team	17.38	2.05923	50
RCSF21 Implementation Strategy & Timeframe	24.58	2.21396	50
RCSF22 Consultant Selection	24.96	2.82814	50
RCSF23 Vendor/Customer Relationships	26.88	2.84741	50
RCSF24 Project Management	24.78	2.81606	50
RCSF25 Client Consultations	24.26	2.64042	50
RCSF26 User Involvement	25.38	3.06987	50
RCSF27 User Education & training	26.18	2.92554	50
RCSF28 Personnel/Staff	25.74	2.59363	50
RCSF29 Employee Attitude & Morale	24.86	3.09054	50
RCSF30 Empowered Decision Makers	27.38	2.05923	50





**Table 5.** Interpretation of Output from the Exploratory Factor Analysis (Source: SPSS V 18.0)

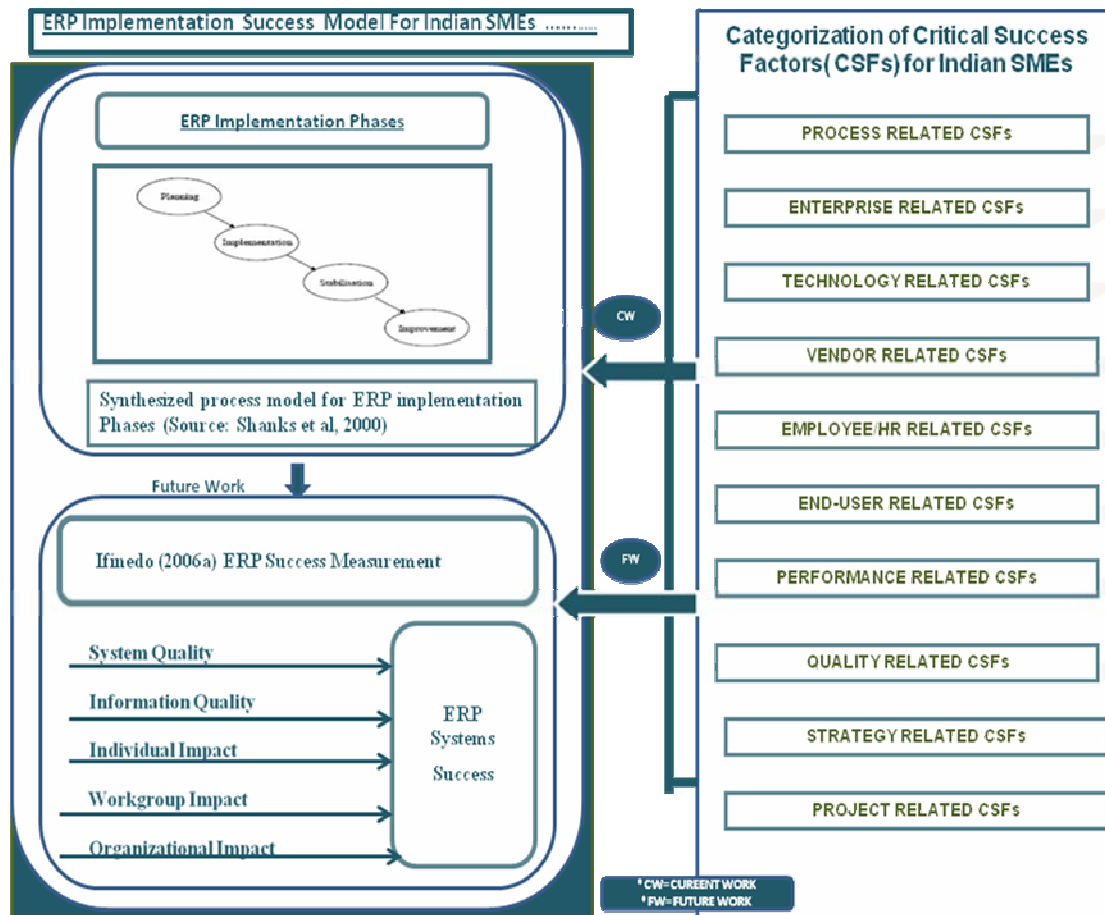
Categorization in terms of Component for CSFs	TVE	List of CSFs for Indian SMEs	RCMV
Component 1 This component was named as Process related CSFs, it consist of the following items:	19.356%	Change Management Process	.895
		BPR and Software Configuration	.870
		Effective Communication Plan	.858
		Risk Management	.857
		Project Champion	.836
		Data Conversion and integrity	.695
Component 2 This component was named as Enterprise related CSFs, it consist of the following items:	11.079%	Post Implementation Evolution	.905
		Focused Performance Measure	.893
		Business Plan, Vision	.703
		Implementation Cost	.635
		Top Management Commitment and Support	-.589
Component 3 This component was named as Technology related CSFs, it consist of the following items:	9.891%	Software Developments, Testing, Trouble Shooting and Crises Management	.830
		Legacy System Consideration	.739
		Client Consolations	.573
Component 4 This component was named as Vendor related CSFs, it consist of the following items:	7.159%	Project Management	.735
		Vanilla ERP	.652
		Vendor/Customer Relationship	.548
Component 5 This component was named as Employee/ HR Related CSFs, it consist of the following items:	6.325%	Employee Attitude and Morale	.851
		Empowered Decision Makers	.675
Component 6 This component was named as End-user related CSFs, it consist of the following items:	5.499%	User Education and Training	.811
		User Involvements	.714
Component 7 This component was named as Performance related CSFs, it consist of the following items:	5.221%	Organizational /Corporate Cultures	.805
		System Documentation	.755
Component 8 This component was named as Quality related CSFs, it consist of the following items:	4.456%	Quality Improvement Measures	.877
		Project Team	.547
Component 9 This component was named as Strategy related CSFs, it consist of the following items:	4.001%	Personnel/Staff	.708
		Selection of ERP Package	.702
		Implementation Strategy and Timeframe	-.416
Component 10 This component was named as Project related CSFs, it consist of the following items:	3.427%	IT Infrastructures	.811
		Consultant Selections	.543

**Table 6.** List of Key Critical Success Factors (KCSFs) for Indian SMEs (Source: SPSS V 18.0)

S.No.	Key Critical Success Factors-KCSFs	Mean	Ranking
1.	Business Plan, Vision	4.26	1
2.	Top Management Commitment and Support	4.58	2
3.	Project Champion	4.78	3
4.	Focused Performance Measure	4.86	4
5.	Change Management Process	4.96	5
6.	Effective Communication Plan	5.44	6
7.	Risk Management	5.74	7
8.	Post Implementation Evolution	6.18	8
9.	BPR and Software Configuration	6.88	9
10.	Quality Improvement Measures	7.32	10
11.	Selection of ERP Package	14.26	11
12.	Organizational /Corporate Cultures	14.58	12
13.	IT Infrastructures	14.78	13
14.	System Documentation	14.86	14
15.	Implementation Cost	14.96	15
16.	Data Conversion and integrity	15.38	16
17.	Vanilla ERP	15.74	17
18.	Legacy System Consideration	16.18	18
19.	Software Developments, Testing, Trouble Shooting and Crises Management	16.88	19
20.	Project Team	17.38	20
21.	Client Consultations	24.26	21
22.	Implementation Strategy and Timeframe	24.58	22
23.	Project Management	24.78	23
24.	Employee Attitude and Morale	24.86	24
25.	Consultant Selections	24.96	25
26.	User Involvements	25.38	26
27.	Personnel/Staff	25.74	27
28.	User Education and Training	26.18	28
29.	Vendor/Customer Relationship	26.88	29
30.	Empowered Decision Makers	27.38	30

Based on the results obtained from the above analysis, the following ERP implementation success model (see Figure 2) can be used to judge the success of ERP implementation at Indian SMEs. The list of Key Critical Success Factors (KCSFs) (see Table 5) for the success of ERP Implementation at Indian SMEs shows the ranking of all the CSFs in terms of their importance on 1 to 30

points scale in order to identify which factors are most important in the success of ERP implementation at Indian SMEs and should get high priority.



**Figure 2.** ERP Implementation Success Model for Indian SMEs (Source: Authors, MS-PowerPoint)

ERP consultants and ERP vendors are recommended to follow these guidelines for successful ERP implementation at India SMEs:

- Top management commitment and support of the organization are necessary for the successful ERP Implementation at Indian SMEs.
- Organizations should be willing to change their businesses process to fit the ERP software in order to minimize the degree of customization.
- To implement ERP systems successfully, the way organizations do business may need to change and the ways people do their jobs also need to change as well.
- The role of project champion is important factor for ERP success.
- Clear business plan, vision, goals and objectives are essential to guide an ongoing organizational effort for successful ERP Implementation.
- Successful ERP implementation needs effective communication plan to communicate about the scope, objectives, updates, changes etc among various functions/levels and especially between business and IT personnel.
- Successful ERP implementation should have some allowance for some kind of post evaluation for continue feedback and support.
- Successful ERP implementation requires risk management to minimize the impact of unplanned incidents in the project by identifying and addressing potential risk before significant consequences occur.
- The progress of the project should monitor actively through set mile stones and targets for successful ERP Implementation.
- Quality Improvement measures helps in successful ERP implementation.
- A key factor for the successful ERP implementation requires a corporate culture that emphasizes the value of sharing common goals over individual pursuits and the value of trust between partners, employees, managers and corporations.

- Success of ERP implementation is determined by the ERP implementation cost also.
- Software development, testing, troubleshooting and crises management are essential activities for the successful ERP implementation.
- IT readiness of the organizations including the architecture and skills leads to the success of ERP implementation.
- Finding a suitable ERP software package is a vital step for successful ERP Implementation.
- Much of the success of ERP implementation process and ultimately the success of the systems rely on the ability of the team to ensure the data accuracy during the conversion process.
- It is important to consider the current legacy system for the success of ERP implementation as it will be a good indicator of the nature and scale of the potentials problems.
- Enterprise commitment to implement vanilla version (Best Business Practice) of ERP helps in successful ERP implementation.
- No ERP implementation can be successful without system documentation (Documentation related to ERP configuration and user training).
- ERP implementation team should be balanced or cross functional and comprise a mix of external consultants and internal staff for the successful ERP Implementation.
- Implementation strategy and timeframe influence the success of ERP implementation.
- Right selection of ERP consultants for knowledge transfer from consultants to company leads to the successful ERP Implementation.
- Success of ERP implementations requires working well with the vendors and customers to resolve the software and other related problems.
- Organizations should have an effective project management strategy to control the ERP implementation process and to make it successful.
- Success of ERP implementation needs to keep its clients apprised of its project to avoid misconceptions.
- Successes of ERP implementations depend on the user involvement that makes the user comfortable with the ERP systems and increase their expertise and knowledge level.
- Users training and education is an important factor for the successful ERP implementation.
- The organization should have domain relevant skills (task knowledge), creativity-relevant skills (cognitive abilities), and task motivation (intrinsic and extrinsic) in order to achieve the creativity to contribute to the success of ERP implementation.
- Employee positive attitude and morale towards ERP adaption makes ERP implementation successful.
- It is needed that implementation team must be empowered to make necessary decisions in due time.

#### 4. Conclusion

The objective of this research paper was to identify and rank the critical success factors that influence success of ERP implementation at Indian SMEs. For this purpose, the paper analyzes Indian ERP consultant's opinions and their ranking for CSFs as a parameter. After the analysis, the following conclusions are drawn: The top most critical success factor for the successful ERP implementation at Indian SMEs is clear business plan and vision followed by top management commitment and support etc see Table 4 and 5. Working hypothesis are accepted with some new categories see Figure 2. It shows that enterprise, vendor, technology and end-user related critical success factors of the large enterprise also have relationship with the successful ERP implementation at Indian SMEs. ERP systems are more than a new information technology. They are more business-process-oriented than technology-oriented. (Davenport, 1998) says an ERP is not a project; it is a way of life. The research framework issues raised in this paper are intended for researchers and professionals who are interested in looking at the CSFs and KCSFs for the successful ERP implementation at Indian SMEs. In India, SMEs are the backbone of the economy and are today faced with global competition. Therefore, it becomes imperative to look for means of responding to the dynamic markets. ERP systems have become the most common IT strategy for most large companies. SMEs too are moving towards ERP systems. They need to adopt a proactive approach towards ERP and consider it as a business solution rather than a mere IT solution. This paper argues that ERP implementation in Indian SMEs should extend its scope beyond the configuration to the strategic, managerial, technical and organizational issues by considering these thirty critical success factors for successful ERP implementation at Indian SMEs that may put Indian SMEs on the competitive position. It can be concluded from the study that thirty critical success factors influence success of ERP implementation at Indian SMEs with different priority. It is hoped that more studies will be conducted in future in order to further examine the black box of ERP implementation at Indian SMEs and enable both practitioners and academic researchers to discover the best ways to make successful ERP implementation.

Like any research, this approach and results have some limitations.

- The sample size is 50 which is comparatively small and that might affect the overall reliability. Limited sample size restricted to Indian SMEs may limit generalization. The factor analysis is only exploratory and not confirmative.

- There is inconsistency between definitions of SMEs size in various studies.
- Limited choices of implementation phases are examined.
- The information contained in this paper is intended only to provide a general summary. It does not suppose to be a complete description of the research issues.

With respect to future research, a number of different approaches could be considered. Single company case studies could be used to uncover some of the critical success factors other than the covered thirty CSFs. Within sector case studies could be used to highlight the critical success factors faced by particular sector. Cross-sector case studies could be used to validate these conclusions as well as to elucidate differences among sectors. Separate critical success factors can be identified for each phase of the ERP implementation at Indian SMEs. A questionnaire-based survey could be used to validate the results of this research with the help of different theoretical framework and the large sample size for each phase of the ERP implementation. Finally, another aspect of ERP success that is success in adoption of ERP systems by the Indian SMEs can also be measured as an extension and validation of these works. Specific industries or organizational sizes might have different organizational characteristics and business requirements for ERP systems and this create a robust research framework and model which may be useful for understanding the critical success factors for the success of ERP implementation at Indian SMEs.

### Nomenclature

CSF	Item related to Identification of Critical Success Factors, Questionnaire One.
ERP	Enterprise Resource Planning
N	Number of respondents in each questionnaire
RCSF	Item related to Ranking of Critical Success Factors, Questionnaire Two.
RCMV	Rotated Component Matrix Value
SMEs	Small-Medium Size Enterprise
TVE	Total Variance Explain and

### Appendix

**Table A.** Definition of Indian SMEs (Source: MSME Development Act, 2006)

Classification	Manufacturing Enterprises*	Service Enterprises**
Micro	Rs. 2.5 million/ Rs. 25 lakh (US\$ 50,000)	Rs. 1 million/ Rs. 10 lakh (US\$ 20,000)
Small	Rs. 50 million/ Rs. 5 crore (US\$ 1 million)	Rs. 20 million/ Rs. 2 crore (US\$ 40,00,000)
Medium	Rs. 100 million/ Rs. 10 crore (US\$ 2 million)	Rs. 50 million/ Rs. 5 crore (US\$ 1 million)

\* Investment limit in Plant and Machinery

\*\* Investment limit in Equipments

### ERP Implementation Phase

It deals with Planning > Implementation > Stabilization > Improvement

- *Planning:* Choosing the ERP package, scoping the project, formulating the system architecture, and approval of budget and schedule.
- *Implementation:* Configuring and implementing the ERP software.
- *Stabilization:* After initial implementation, a stabilization stage occurs when implementation problems are fixed and organizational performance improves.
- *Improvement:* Achieving the benefits, updating new modules, focusing on continuous improvement and transformation.

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